AMENDMENT NO. 1 SEPTEMBER 2014
TO
IS 16098 (PART 1) : 2013 STRUCTURED-WALL PLASTICS PIPING SYSTEMS FOR NON-PRESSURE DRAINAGE AND SEWERAGE — SPECIFICATION

PART 1 PIPES AND FITTINGS WITH SMOOTH EXTERNAL SURFACE, TYPE A

(*Page* 15, *clause* **A-3**, *para* 3, *line* 8) — Substitute ‘(*see* **A-1**)’ *for* ‘(*see* **D-1**)’.

(*Page* 23, *clause* **E-2**) — Substitute ‘Y_t’ *for* ‘Y_1’ *and* ‘γ — creep ratio’ *for* ‘y — creep ratio’.

(*Page* 23, *clause* **E-4.3**, *line* 4) — Substitute ‘d_i’ *for* ‘d_n’.

(*Page* 23, *clause* **E-4.3**, *line* 7) — Substitute ‘0.1 percent’ *for* ‘1 percent’.

(*Page* 23, *clause* **E-4.3,** *line* 3) — Insert the following new sentence at the end:

‘An example of a device for measuring the inside diameter of corrugation is shown in Fig. 12.’

(*Page* 24, *clause* **E-5.2.3**) — Insert the following new clauses:

‘**E-5.2.4** Structured wall pipes with perpendicular ribs, corrugations or other regular structures, shall be cut such that each test piece contain a whole number of ribs, corrugations or other structures. The cuts shall be made at the midpoint between the ribs, corrugations or other structures.

The length of the test pieces shall be the minimum whole number of ribs, corrugations or other structures resulting in a length of 290 mm or greater or, for pipes having nominal diameter greater than 1 500 mm, the length of the test pieces shall be $0.2d_n$ or greater (*see* Fig. 13).’

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E-5.2.5 Structured wall pipes with helical ribs, corrugations or other regular structures shall be cut such that the length of the test pieces is equal to the inside diameter ± 20 mm but not less than 290 mm nor greater than 1 000 mm.'

(*Page* 24, *clause* **E-7.5**, *formula*) — Substitute '$\frac{\delta}{d_\mathrm{i}} = 0.015 \pm 0.002$' *for* '$\frac{\delta}{d_\mathrm{i}} = 0.15 \pm 0.002$'.

(*Page* 24, *clause* **E-7.5**, *para* 2) — Substitute the following for the existing para:

'At the moment that the full force F is achieved, start the timer.'

(*Page* 24, *clause* **E-7.5**) — Insert the following new clause and renumber the subsequent clauses:

'**E-7.6** Determine the initial deflection, y_0, 6 min after the application of the full load. Then determine the deflection after application of the full load after 1 h, 4 h, 24 h, 168 h, 336 h, 504 h, 600 h, 696 h, 840 h and 1 008 h.

If the value of y_0 is outside the limits specified in **E-7.5** interrupt the test, recondition the test piece for at least one hour and restart the test at **E-7.3**.

Where it is not possible to read the deflection gauges at the appropriate times between 500 h and 1 008 h, it is permitted to deviate by 24 h, providing the actual time for measurement is used for plotting in accordance with **E-8**. For example, in case, the deflection is read after 862 h, instead of reading at 840 h, then the value of 862 h is used in the regression analysis.

NOTE — When the creep test is started on a Monday or Thursday, interference with weekends does not occur.

E-8 DETERMINATION OF THE CREEP RATIO

For each of the three test pieces, plot the deflection in meters against the logarithm of time in hours in a single logarithmic co-ordinate system (*see* Fig. 16) and determine by linear regression the equation of the straight line:

$$Y_{\mathrm{t}} = B + M \log t$$

through all eleven points and through the last ten points, through the last nine points,...., and through the last five points (*see* Table 17), where the constants B and M and the coefficient of correlation, R, are determined using following equations given below, that is, the method of least squares:

$$M = \frac{N\sum x_i y_i - \sum y_i \sum x_i}{N\sum x_i^2 - \left(\sum x_i\right)^2}$$

$$B = \frac{\sum y_i - M\sum x_i}{N}$$

$$R = \left[\frac{M\left(N\sum x_i y_i - \sum x_i \sum y_i\right)}{N\sum y_i^2 - \left(\sum y_i\right)^2}\right]^{1/2}$$

where

B = theoretical deflection, in millimetres at $t = 1$ h;
M = gradient coefficient;
N = number of points on the deflection curve used for the linear regression;
R = coefficient of correlation (if R has a value between 0.99 and 1.00, it is assumed that the plotted points lie on a straight line);
Y_2 = extrapolated deflection, in millimetres, after two year (17 520 h);
t_i = time for point i;
x_i = log (t_i); and
y_i = measured total defection at time t_i.

For the seven equations of $Y_t = B + M \log t$, obtained for a given test piece, calculate the extrapolated two-year deflection Y_2 ($t = 2$ years = 17 520 h) (*see* Table 17).

Choose as the value for the two years' deflection Y_2, (for calculation of the creep ratio of the test piece), the highest calculated Y_2 that is accompanied by a coefficient of correlation, R, of 0.999 or the highest value between 0.990 and 0.999.

If the highest value is less than 0.990, *see* **E-9**.

Having determined Y_2, calculate the creep ratio for each of the three test pieces using following equations:

$$\gamma_\mathrm{A} = \frac{Y_\mathrm{2A}\left(0.018\,6 + 0.025\left(y_\mathrm{0A}/d_\mathrm{i}\right)\right)}{y_\mathrm{0A}\left(0.018\,6 + 0.025\left(Y_\mathrm{2A}/d_\mathrm{i}\right)\right)}$$

$$\gamma_\mathrm{B} = \frac{Y_\mathrm{2B}\left(0.018\,6 + 0.025\left(y_\mathrm{0B}/d_\mathrm{i}\right)\right)}{y_\mathrm{0B}\left(0.018\,6 + 0.025\left(Y_\mathrm{2B}/d_\mathrm{i}\right)\right)}$$

$$\gamma_\mathrm{C} = \frac{Y_\mathrm{2C}\left(0.018\,6 + 0.025\left(y_\mathrm{0C}/d_\mathrm{i}\right)\right)}{y_\mathrm{0C}\left(0.018\,6 + 0.025\left(Y_\mathrm{2C}/d_\mathrm{i}\right)\right)}$$

Calculate and record the creep ratio of the pipe as the arithmetic average of the three calculated values using following equation:

$$\gamma = \frac{\gamma_\mathrm{A} + \gamma_\mathrm{B} + \gamma_\mathrm{C}}{3},$$

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